A brief experiment with axiophytes, weighted scores and broad habitats in Norfolk

For an explantion of axiophytes, see the BSBI web site: www.bsbi.org.uk

Method

A draft list of 546 axiophyte species was compiled for Norfolk. Scores were then assigned to these species, primarily based on Ellenberg values but with a little additional manipulation to reflect local significance and less general habitats.

On the assumption that most "worthy" habitats reflect one or more of: low nutrients; extremes of pH and lack of shade, the Ellenberg value weighting was formulated as follows:
All species were assigned one point. Points were then added cumulatively according to the Ellenberg values as listed in *Plantatt (2004)*.
Nitrogen: N=1 add 3, N=2 add 2, N=3 add 1.
Reaction: R=2 add 2, R=3 add 1, R=9 add 2, R=8 add 1.
Light: L=9 add 2, L=8 add 1.
Additions of -1 (to "downgrade" two very widespread species) to 3 points were applied to some species for local significance (see appendix 1).

To investigate broad habitats, the species assignments published in *Plantatt* were used. The following eleven habitats were considered: Broadleaved, mixed and yew woodland; Neutral grassland; Calcareous grassland; Acid Grassland; Dwarf shrub heath; Fen, marsh and swamp, Bog, Standing water and canals; Rivers and streams, Supralittoral sediment (strandlines, shingle, coastal dunes) and Littoral sediment. BH4 (Arable and horticultural) was included but no appropriate sites were included at this stage.

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One hundred sites were arbitrarily selected, the only criterion being that a reasonable species list had been gathered since 2000 and a wide range habitats and size of site were covered. Species lists were extracted from the vice-county recorders' database using 2000-2009 data. Adjustments were made for segregates (e.g. *Carex divulsa* subspecies are treated together at species level). Analysis was carried out using MS Access (but could equally well be achieved using a spreadsheet). Graphs were produced using MS Excel.

Results

(i) Weighted scores
Figure 1 shows a simple count of axiophytes for each site, ranging from 5 to 112, in ascending order. The sum of weighted scores for each site is overlaid on this in Figure 2. It is clear that sites with habits of conservation interest that are relatively species-poor gain in apparent significance compared to a simple count, particularly sites with bog and dwarf shrub heath such as Cawston Heath (SSSI), Horsford Heath (C site), Bryant's Heath (SSSI), Roydon Common (SSSI) and Dersingham Bog (NNR). There are also some (more subtle) gains for neutral, calcareous and acid grasslands, e.g. New Buckenham Common (neutral), Cockthorpe Common (calcareous), Brancaster Barrow Common (acid) and Cranwich Camp (both acid and calcareous).

(ii) Broad habitats
Figure 3 shows the breakdown within each site of the component broad habitats (as indicated by the weighted scores for species). When treated separately, the individual components can be more clearly compared (Figure 4) and can indicate "good" sites even for neutral grassland. Both unweighted and weighted scores readily reveal the better sites, but perhaps the weighted scores are more clear cut. Figure 5 shows a number of the broad habitats treated in this way. It is clear that many sites with strong single habitat components are at the lower end of the spectrum of axiophyte counts.

Examples

Five example worksheets are included in appendix 3.

a) **Holt Lowes** is a SSSI of about 49.5 Ha with a mixture of dwarf shrub heath, bracken, birch and oak woodland, some wet woodland and both acid and calcareous mires. It is notable as the only Norfolk site for *Equisetum sylvaticum* and *Pyrola minor*. Unsurprisingly it scores well for bog, dwarf shrub heath and fen, marsh and swamp. It alsoo scores

b) **Beachamwell Fen** is a County Wildlife Site of about 16 Ha, largely unimproved/semi-improved grassland and fen. It scores reasonably well for calcareous grassland but disappointingly poorly for fen, marsh and swamp, given the presence of *Cladium mariscus* and *Schoenus nigricans*. This may in part be a reflection of the large number of axiophytes in this group and the rather wide range of habitats included in it, but undoubtedly the site has potential for more fen species.

c) **North Denes, Great Yarmouth** is a SSSI of about 74 Ha with strandline, sand dunes and acid dune slacks. It notable for large populations of *Corynephorus canescens* and *Jasione montana*. It is no surprise at all that the site scores well for Supralittoral sediment. There is also a strong acid grassland component reflecting the nature of the slacks.

d) **Boyland Common** is a County Wildlife Site of about 3.9 Ha of largely unimproved/semi-improved neutral grassland. There is a reasonable neutral grassland score for this mostly single-habitat site.

e) **Lord Anson's Wood** (and adjacent lands) is an undesignated site of about 66 Ha, mainly coniferous plantation. There are some wide rides that reveal the potential for dwarf shrub heath, and this is borne out by a reasonable score for that habitat.

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Discussion

Axiophytes are a powerful tool for assessing the botanical quality of sites. They may also prove useful in showing changes over time especially after conservation management (or lack of it). Assigning weighted scores improves the power of the analysis without changing the simplicity of the survey method (i.e. a simple but thorough species list). This is particularly the case for habitat components that are of conservation interest but are relatively species-poor.

Breakdown by broad habitat further improves the analysis and can highlight sites of conservation interest with a single habitat. The full axiophyte count measures the habitat diversity of a site as much as the botanical interest. Of course, that in itself is a valuable datum.

Broad habitat 11 (Fen, marsh and swamp) has a wide selection of axiophytes (113) in Norfolk. It may be possible to further subdivide this grouping, perhaps to distinguish the swamps and tall-herb fens from the mires and fen-meadows.

References

Hill, M.O., Preston, C.D. & Roy, .B. *Plantatt* (2004) Centre for Ecology and Hydrology

RWE 3rd January 2010

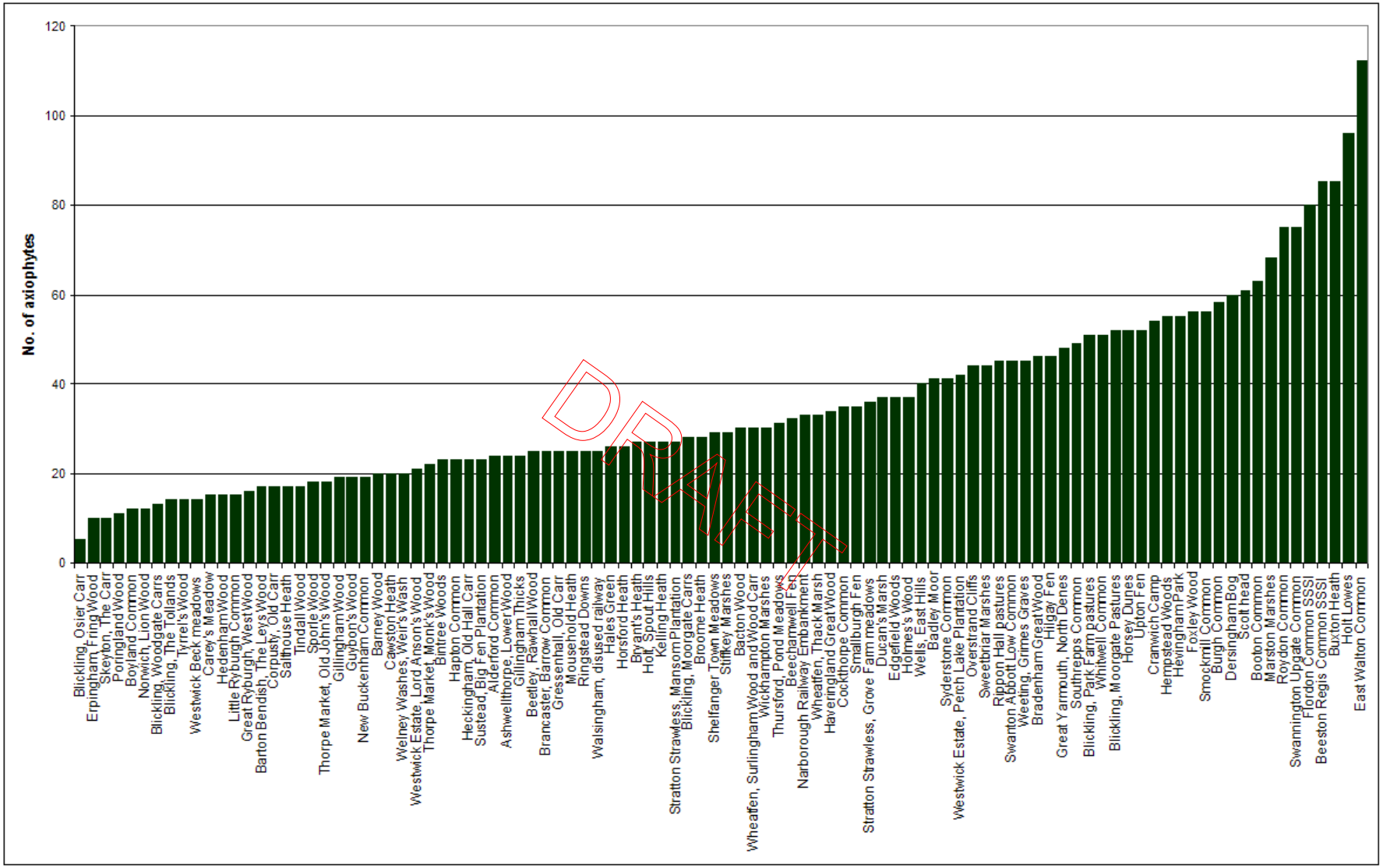


Figure 1. A simple count of axiophytes (arranged in ascending order)
Subsequent graphs maintain the same order.

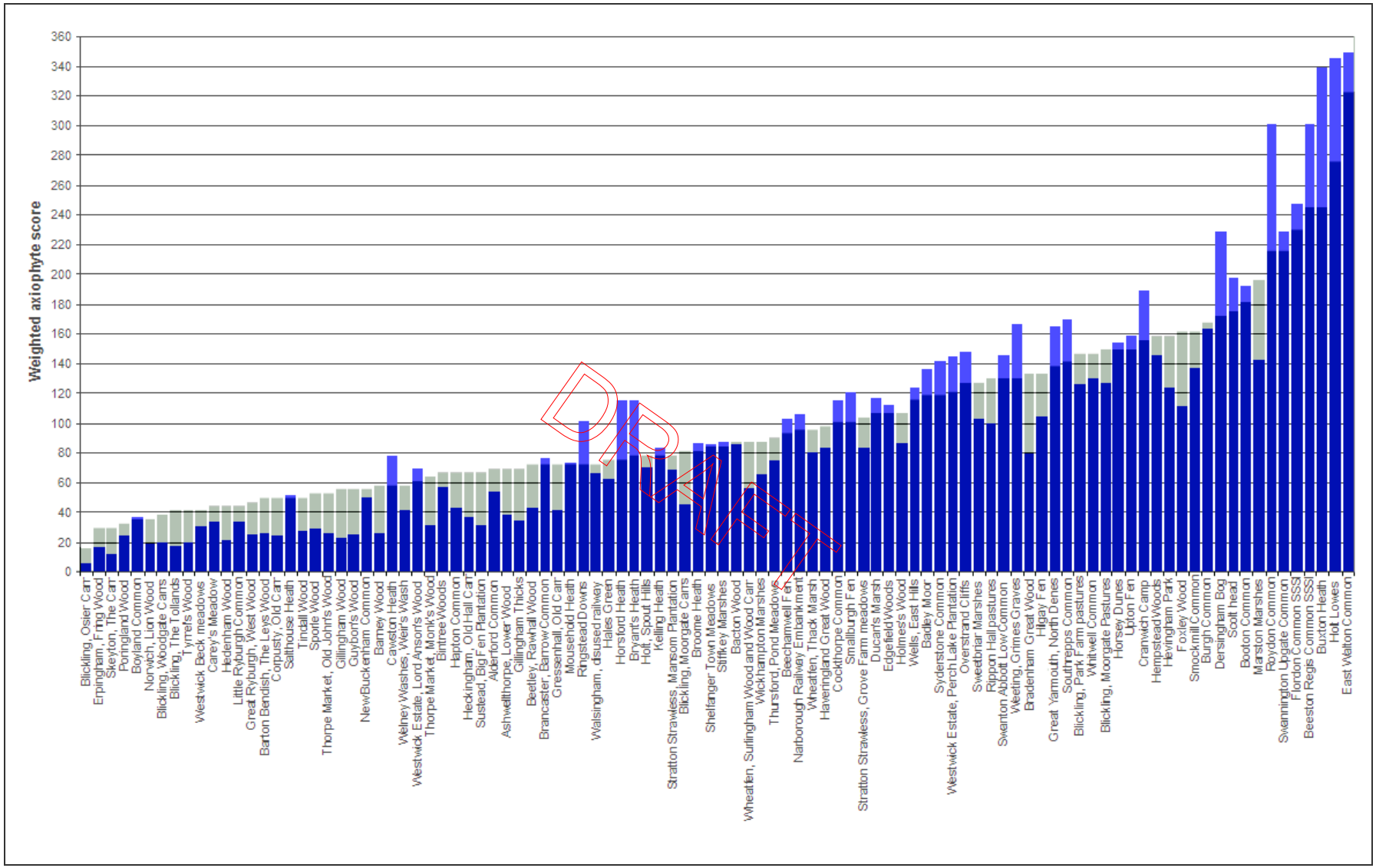


Figure 2. Comparison of weighted axiophytes scores with the simple count

Species-poor habitats gain in relative significance, particularly bog and dwarf shrub heath sites, e.g. Horsford Heath, Bryant's Heath and Dersingham Bog (perhaps a little excessively so).

There is also some emphasis on neutral, calcareous and acid grasslands, e.g. New Buckenham Common (neutral), Cockthorpe Common (calcareous), Brancaster Barrow Common (acid) and Cranwich Camp (both acid and calcareous). Note: scale of background counts not shown (see Fig. 1).

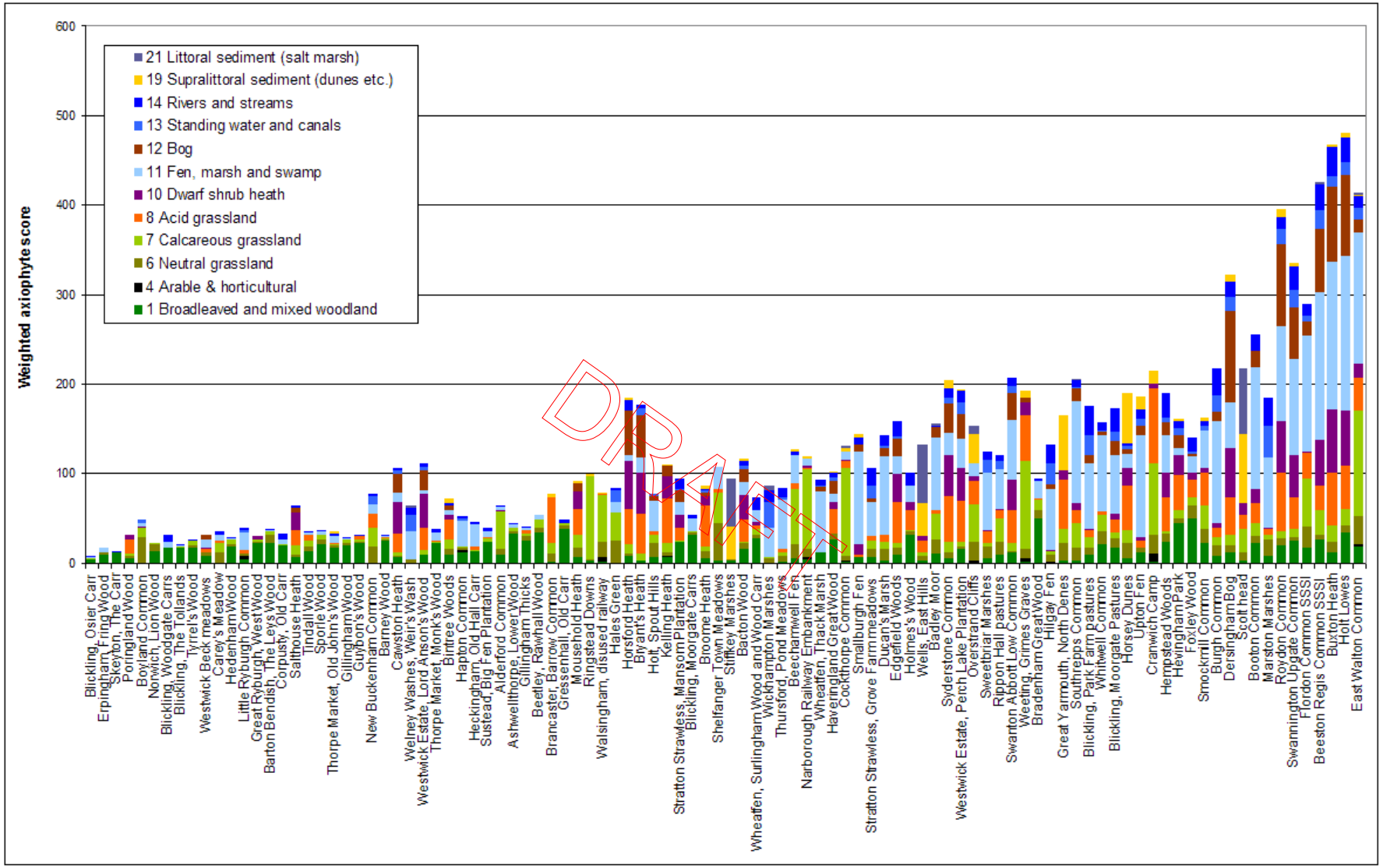
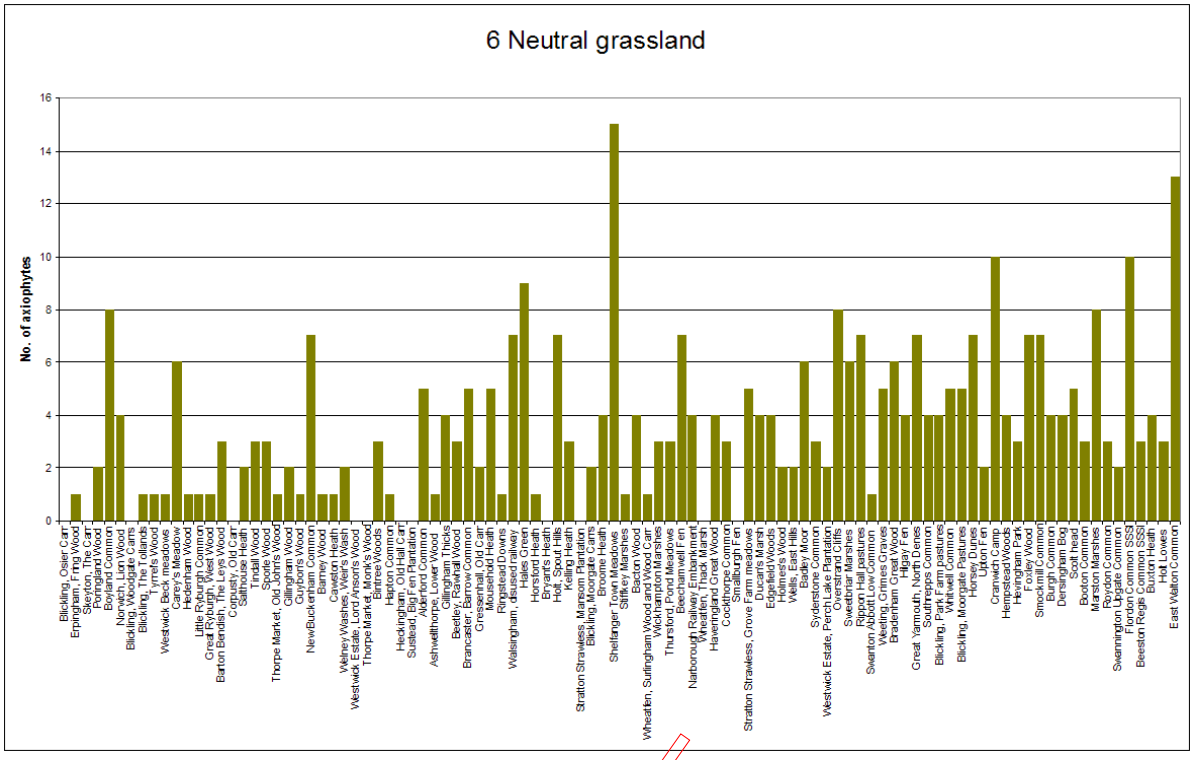
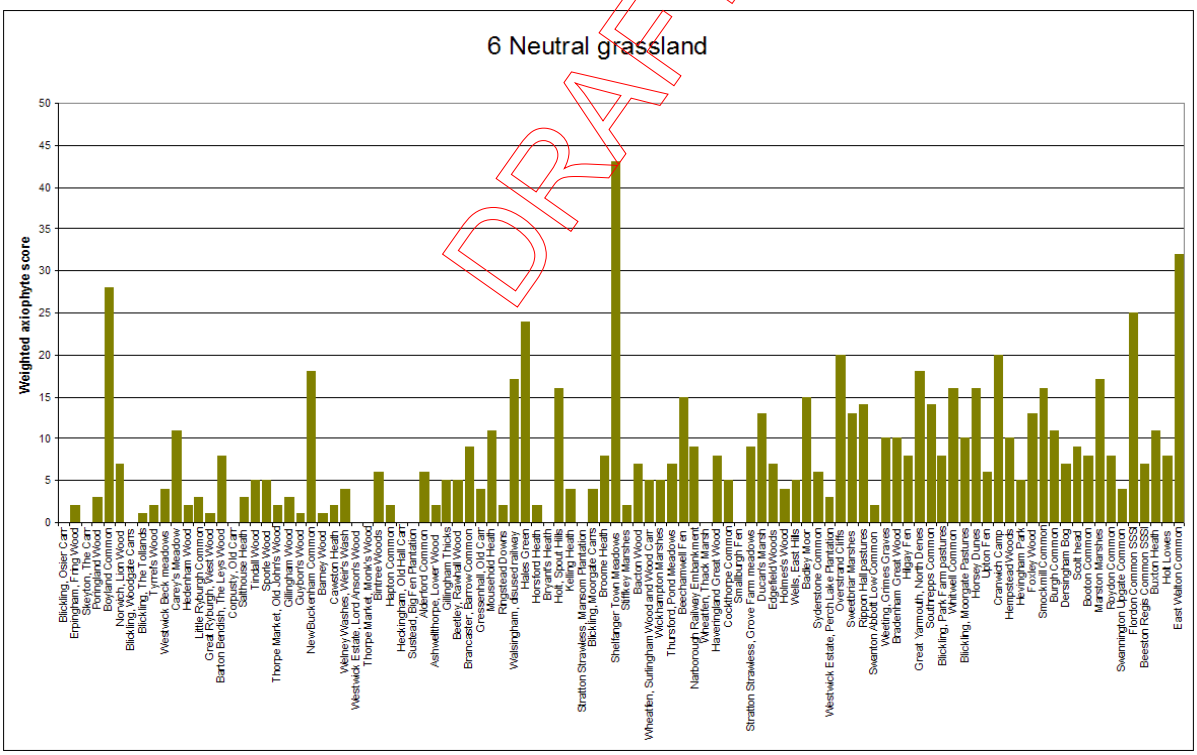


Figure 3. Sums of weighted axiophyte scores split by broad habitat

Note that some species are assigned to more than one broad habitat (therefore counting more than once in the accumulations).



a) Unweighted



b. Weighted

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Figure 4. Comparison of counts and weighted scores for a single broad habitat.

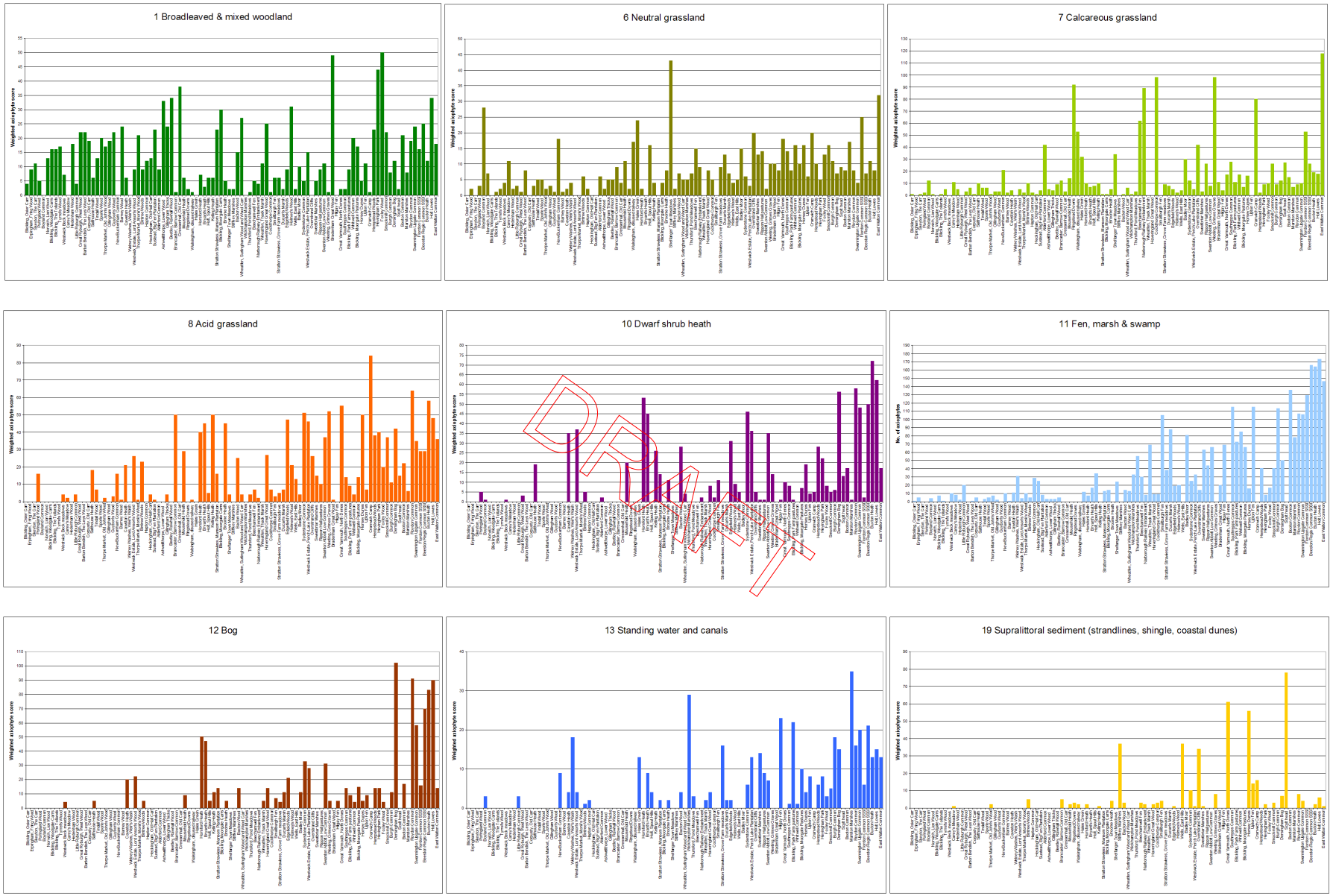

Figure 5. Weighted scores for some broad habitats

Note that a number of sites towards the left-hand end of these graphs are emphasised, which is not the case with a simple count of all axiophytes

Appendix 1. Draft Norfolk Axiophytes and weighted scores

Species	Local Factor	Score
Aceras anthropophorum	2	5
Achillea ptarmica	2	4
Adoxa moschatellina		1
Agrimonia procera		1
Agrostis canina		3
Agrostis vinealis		4
Aira caryophyllea	1	5
Aira praecox		4
Alchemilla filicaulis subsp. *vestita*	1	4
Alisma lanceolatum		2
Allium ursinum		1
Allium vineale		2
Alopecurus aequalis	2	4
Alopecurus geniculatus		2
Althaea officinalis	1	3
Ammophila arenaria		4
Anacamptis pyramidalis		4
Anagallis minima	1	4
Anagallis tenella		3
Anemone nemorosa	1	2
Anthemis arvensis	2	3
Anthemis cotula	2	3
Anthriscus caucalis		1
Anthyllis vulneraria		4
Apera interrupta		4
Apera spica-venti	1	2
Apium graveolens		2
Apium inundatum	2	3
Arabis glabra	3	5
Arabis hirsuta		3
Armeria maritima		2
Asperula cynanchica	2	6
Asplenium adiantum-nigrum		1
Asplenium ruta-muraria		3
Asplenium trichomanes		4
Aster tripolium		3
Astragalus danicus	3	8
Astragalus glycyphyllos		2
Athyrium filix-femina	1	2
Atriplex glabriuscula		3
Atriplex laciniata		3
Atriplex portulacoides		4
Baldellia ranunculoides	1	5
Berula erecta		1
Bidens cernua		2
Bidens tripartita		2
Blackstonia perfoliata	1	6
Blechnum spicant	1	4
Blysmus compressus	3	7
Bolboschoenus maritimus		3
Botrychium lunaria	3	7
Briza media		3
Bromopsis erecta	1	4
Bromopsis ramosa		1
Bromus racemosus sens. lat.		1
Bromus secalinus	1	2
Bupleurum tenuissimum	2	6
Butomus umbellatus	1	2
Cakile maritima		3
Calamagrostis canescens		1
Calamagrostis stricta	3	8
Callitriche hamulata sens. lat.		2
Calluna vulgaris		5
Calystegia soldanella		3
Campanula glomerata	3	6
Campanula rotundifolia	1	4
Campanula trachelium	1	2
Cardamine amara		1
Carduus tenuiflorus		2
Carex acuta		1
Carex appropinquata	2	4
Carex arenaria		4
Carex binervis	1	5
Carex caryophyllea	1	4
Carex curta		5
Carex diandra	3	6
Carex dioica	3	7
Carex distans	1	3
Carex disticha	1	2
Carex divisa	2	4
Carex echinata		5
Carex elata		1
Carex ericetorum	3	8
Carex extensa	1	3
Carex hostiana	1	5
Carex laevigata		1
Carex lasiocarpa	2	5
Carex muricata subsp. lamprocarpa		1
Carex nigra		3
Carex otrubae		1
Carex ovalis		1
Carex pallescens	1	2
Carex panicea		4
Carex paniculata	2	3
Carex pilulifera		4
Carex pseudocyperus		1
Carex pulicaris	2	6
Carex remota		1
Carex rostrata		4
Carex spicata		1
Carex strigosa	2	3
Carex sylvatica		1
Carex vesicaria	1	3
Carex viridula subsp. *brachyrrhyncha*		5
Carex viridula subsp. *oedocarpa*	1	5
Carex viridula subsp. *viridula*	2	5
Carlina vulgaris	1	5
Catabrosa aquatica	1	2
Catapodium marinum		4
Catapodium rigidum		4
Centaurea scabiosa		4
Centaurium pulchellum		4
Cerastium arvense	1	4
Cerastium diffusum		4
Cerastium semidecandrum		3
Ceratocapnos claviculata	1	2
Ceratophyllum submersum	1	3
Ceterach officinarum		5
Chaenorhinum minus		2
Chenopodium hybridum	2	3
Chenopodium murale	1	3
Chenopodium polyspermum	1	2
Chrysanthemum segetum	1	2
Chrysosplenium alternifolium	3	4
Chrysosplenium oppositifolium	1	2
Cicuta virosa	3	4
Cirsium acaule		5
Cirsium dissectum	1	5
Cladium mariscus	1	4
Clinopodium acinos		6
Clinopodium calamintha		5
Clinopodium vulgare		1
Cochlearia anglica		2
Cochlearia officinalis		2
Conopodium majus		1
Corynephorus canescens		7
Crambe maritima	1	5
Crassula tillaea		4
Crataegus laevigata		1
Crepis biennis	1	3
Crithmum maritimum		3
Cruciata laevipes		1
Cuscuta epithymum		5
Cynoglossum officinale		3
Dactylorhiza fuchsii		2
Dactylorhiza incarnata subsp. *coccinea*	2	4
Dactylorhiza incarnata subsp. *incarnata*	1	5
Dactylorhiza maculata		4
Dactylorhiza praetermissa		3
Dactylorhiza traunsteineri	1	5
Danthonia decumbens	1	4
Daphne laureola		1
Deschampsia flexuosa		4
Descurainia sophia		2
Dianthus deltoides	2	6
Dipsacus pilosus		2
Drosera anglica	3	9
Drosera intermedia	3	9
Drosera rotundifolia		7
Dryopteris affinis sens. lat.		1
Dryopteris carthusiana		1
Dryopteris cristata	3	4
Echium vulgare		2
Eleocharis multicaulis	1	6

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Species	Local Factor	Score
Eleocharis quinqueflora	1	6
Eleocharis uniglumis	1	3
Eleogiton fluitans	1	5
Elymus caninus		1
Elytrigia juncea		3
Epilobium palustre		2
Epipactis helleborine	1	2
Epipactis palustris	2	5
Epipactis phyllanthes	1	2
Equisetum fluviatile		2
Equisetum hyemale	2	3
Equisetum sylvaticum	2	3
Equisetum telmateia		1
Erica cinerea	1	6
Erica tetralix		7
Erigeron acer		3
Eriophorum angustifolium		5
Eriophorum latifolium	3	8
Eriophorum vaginatum		7
Eryngium maritimum		3
Erysimum cheiranthoides		1
Euonymus europaeus		2
Euphorbia amygdaloides subsp. *amygdaloides*	1	2
Euphorbia exigua		1
Euphorbia paralias		3
Euphrasia anglica	2	4
Euphrasia confusa	1	5
Euphrasia nemorosa	1	2
Euphrasia pseudokerneri	3	6
Festuca arenaria		3
Festuca gigantea		1
Festuca ovina agg.		3
Festuca pratensis		1
Filago lutescens	1	6
Filago minima		4
Filago vulgaris		1
Filipendula vulgaris		4
Frangula alnus	1	2
Frankenia laevis	1	5
Fumaria densiflora		3
Fumaria parviflora	1	4
Gagea lutea	3	4
Galeopsis angustifolia	2	5
Galeopsis speciosa	2	3
Galium odoratum	1	2
Galium parisiense	1	5
Galium saxatile		3
Galium uliginosum		1
Genista anglica	3	8
Genista tinctoria	2	6
Gentiana pneumonanthe	3	8
Gentianella amarella	1	6
Gentianella campestris	2	5
Geranium columbinum	2	3
Geum rivale	2	3
Glaucium flavum		4
Glaux maritima		2

Species	Local Factor	Score
Glyceria declinata	1	2
Glyceria notata		1
Gnaphalium sylvaticum	2	4
Groenlandia densa	2	5
Gymnadenia conopsea	3	5
Hammarbya paludosa	1	9
Helianthemum nummularium	1	4
Helictotrichon pratense	1	4
Helictotrichon pubescens		2
Helleborus viridis		2
Herniaria glabra	2	6
Hieracium sp.	1	2
Hippocrepis comosa	3	8
Hippuris vulgaris		1
Honckenya peploides		3
Hordeum marinum	1	5
Hordeum secalinum		2
Hottonia palustris	1	2
Hyacinthoides non-scripta		1
Hydrocharis morsus-ranae	1	2
Hydrocotyle vulgaris		3
Hyoscyamus niger		2
Hypericum elodes		5
Hypericum hirsutum	1	2
Hypericum humifusum	1	3
Hypericum maculatum	1	2
Hypericum montanum	1	5
Hypericum pulchrum	1	3
Hypochaeris glabra		4
Inula conyzae		3
Isolepis cernua	1	4
Isolepis setacea		2
Jasione montana	2	5
Juncus acutiflorus		4
Juncus acutus	2	6
Juncus ambiguus	1	4
Juncus bulbosus		3
Juncus compressus		2
Juncus foliosus		2
Juncus gerardii		2
Juncus maritimus		3
Juncus squarrosus		5
Juncus subnodulosus	1	4
Kickxia elatine		1
Kickxia spuria	2	3
Koeleria macrantha	1	5
Lamiastrum galeobdolon subsp. *montanum*	1	2
Lamium amplexicaule	1	2
Lathyrus nissolia		2
Lathyrus palustris	3	4
Lathyrus sylvestris		4
Legousia hybrida	1	2
Leontodon hispidus		3
Leontodon saxatilis		3
Leymus arenarius		3
Limonium bellidifolium	3	7
Limonium binervosum	1	5

Species	Local Factor	Score
Limonium humile	1	4
Limonium vulgare		4
Limosella aquatica	1	3
Linum bienne		2
Linum catharticum		4
Liparis loeselii	3	7
Listera ovata		1
Lithospermum arvense	2	4
Lithospermum officinale		2
Lotus corniculatus	-1	2
Lotus glaber	1	2
Lotus pedunculatus		1
Luronium natans	2	5
Luzula campestris		3
Luzula multiflora		3
Luzula pilosa	1	3
Luzula sylvatica		1
Lychnis flos-cuculi		1
Lysimachia nemorum		1
Lysimachia vulgaris	1	2
Lythrum portula	1	4
Marrubium vulgare	1	4
Medicago minima	1	6
Medicago sativa subsp. *falcata*		3
Melampyrum cristatum	3	7
Melampyrum pratense	1	5
Melica uniflora	1	2
Menyanthes trifoliata		3
Milium effusum	1	2
Minuartia hybrida		5
Misopates orontium	1	2
Moehringia trinervia		1
Moenchia erecta		4
Molinia caerulea		4
Monotropa hypopitys	1	4
Montia fontana	2	4
Myosotis discolor		2
Myosotis laxa		1
Myosotis ramosissima		3
Myosotis secunda	3	4
Myosurus minimus	3	5
Myrica gale		5
Myriophyllum alterniflorum		2
Myriophyllum verticillatum	3	4
Najas marina	3	6
Nardus stricta	1	5
Narthecium ossifragum	2	9
Neottia nidus-avis	2	3
Nepeta cataria	2	3
Oenanthe aquatica	2	3
Oenanthe fistulosa	1	2
Oenanthe fluviatilis	1	4
Oenanthe lachenalii	1	4
Ononis repens		3
Ononis spinosa		4
Ophioglossum vulgatum	2	5
Ophrys apifera		4
Orchis mascula	1	2

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Species	Local Factor	Score
Orchis morio	3	6
Oreopteris limbosperma	3	5
Origanum vulgare		1
Ornithopus perpusillus	2	4
Orobanche elatior	1	5
Orobanche minor		2
Orobanche purpurea	3	6
Osmunda regalis	3	4
Oxalis acetosella	1	2
Papaver argemone	3	4
Papaver dubium	2	3
Papaver hybridum	1	3
Parapholis incurva		3
Parapholis strigosa		2
Paris quadrifolia	3	4
Parnassia palustris	3	6
Pedicularis palustris	2	6
Pedicularis sylvatica	1	6
Persicaria bistorta	2	3
Persicaria minor	1	2
Persicaria mitis	1	2
Petroselinum segetum	2	5
Peucedanum palustre	3	4
Phleum arenarium	1	5
Phleum phleoides	3	8
Picris hieracioides		4
Pilosella officinarum		4
Pimpinella saxifraga		2
Pinguicula vulgaris	3	7
Plantago coronopus		2
Plantago maritima		2
Plantago media	1	4
Platanthera bifolia	3	6
Platanthera chlorantha	3	4
Poa bulbosa		4
Poa nemoralis		1
Polygala serpyllifolia		6
Polygala vulgaris	1	4
Polygonum oxyspermum subsp. *raii*		3
Polygonum rurivagum		3
Polypodium vulgare sens. lat.		2
Polystichum aculeatum	1	2
Polystichum setiferum	1	2
Potamogeton acutifolius	3	4
Potamogeton alpinus	1	2
Potamogeton berchtoldii		1
Potamogeton coloratus	3	5
Potamogeton compressus	2	3
Potamogeton crispus		1
Potamogeton friesii	1	2
Potamogeton gramineus	2	4
Potamogeton lucens		1
Potamogeton obtusifolius	1	2
Potamogeton perfoliatus	1	2
Potamogeton polygonifolius		4
Potamogeton pusillus		1
Potamogeton trichoides	2	3
Potentilla anglica	1	2
Potentilla argentea		4
Potentilla erecta		4
Potentilla palustris	1	4
Primula veris		2
Prunus padus		1
Puccinellia fasciculata	2	4
Puccinellia maritima		3
Puccinellia rupestris	2	5
Pyrola minor	3	6
Pyrola rotundifolia subsp. *rotundifolia*	3	5
Radiola linoides	2	6
Ranunculus aquatilis sens. lat.		1
Ranunculus auricomus	2	3
Ranunculus baudotii		1
Ranunculus bulbosus		1
Ranunculus circinatus		1
Ranunculus fluitans		1
Ranunculus hederaceus	1	2
Ranunculus lingua	1	2
Ranunculus sardous		2
Ranunculus trichophyllus	1	2
Raphanus raphanistrum subsp. *maritimus*		1
Rhamnus cathartica		1
Rhinanthus minor	1	2
Rhynchospora alba	2	9
Rorippa amphibia		2
Rorippa palustris		2
Rorippa sylvestris		2
Rosa micrantha		2
Rosa pimpinellifolia		3
Rosa tomentosa		1
Rumex acetosella	-1	1
Rumex hydrolapathum		1
Rumex maritimus		2
Rumex palustris	1	2
Ruppia cirrhosa		1
Ruppia maritima	1	5
Sagina maritima		3
Sagina nodosa	3	6
Sagittaria sagittifolia		1
Salix aurita	1	3
Salix purpurea		2
Salix repens	1	4
Salix triandra		1
Salsola kali subsp. kali		3
Salvia verbenaca		4
Samolus valerandi		3
Sanguisorba minor subsp. *minor*		3
Sanguisorba officinalis	3	4
Sanicula europaea		1
Sarcocornia perennis		4
Saxifraga granulata	1	3
Saxifraga tridactylites		3
Scabiosa columbaria		5
Scandix pecten-veneris	3	4
Schoenoplectus lacustris		2
Schoenoplectus tabernaemontani		4
Schoenus nigricans	3	7
Scleranthus annuus	2	3
Scleranthus perennis subsp. *prostratus*	2	6
Scrophularia umbrosa		1
Scutellaria galericulata		1
Scutellaria minor	3	6
Sedum acre		4
Sedum anglicum		4
Sedum telephium		1
Senecio aquaticus		1
Seriphidium maritimum		4
Silaum silaus		2
Silene conica	1	5
Silene gallica	3	4
Silene noctiflora		1
Silene otites	3	7
Silene uniflora		2
Sison amomum		1
Sium latifolium	3	4
Solidago virgaurea	1	3
Sonchus palustris		1
Sparganium natans	2	4
Spartina anglica		4
Spergula arvensis		1
Spergularia marina		3
Spergularia media		3
Spergularia rubra		4
Spiranthes spiralis	2	5
Spirodela polyrhiza		1
Stachys arvensis		2
Stachys officinalis		2
Stachys palustris		1
Stellaria neglecta		1
Stellaria pallida		1
Stellaria palustris	3	4
Stratiotes aloides	3	4
Suaeda maritima		4
Suaeda vera		4
Succisa pratensis	1	4
Teesdalia nudicaulis		6
Thalictrum flavum		1
Thelypteris palustris	1	2
Thymus polytrichus		4
Thymus pulegioides		5
Thymus serpyllum	3	7
Torilis nodosa		2
Trichophorum cespitosum		7
Trifolium arvense		5
Trifolium fragiferum	2	4
Trifolium glomeratum		5
Trifolium medium		1
Trifolium ochroleucon	3	7
Trifolium ornithopodioides	1	5
Trifolium scabrum		5

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Species	Local Factor	Score
Trifolium striatum		4
Trifolium subterraneum	1	5
Trifolium suffocatum	1	5
Triglochin maritimum		2
Triglochin palustre	1	5
Tripleurospermum maritimum		2
Trisetum flavescens		1
Typha angustifolia		2
Ulex gallii	1	5
Utricularia intermedia sens. lat.	3	7
Utricularia minor	3	7
Utricularia vulgaris sens. lat.	1	2
Vaccinium oxycoccos	3	9
Valeriana dioica	1	4

Species	Local Factor	Score
Valerianella dentata	2	4
Valerianella locusta		2
Verbascum nigrum		1
Verbascum pulverulentum		2
Veronica agrestis	1	2
Veronica anagallis-aquatica agg.		1
Veronica montana		1
Veronica officinalis		1
Veronica polita		1
Veronica scutellata		3
Veronica spicata subsp. *spicata*		4
Veronica triphyllos	1	3
Veronica verna		5
Vicia lathyroides		3

Species	Local Factor	Score
Vicia sativa subsp. *nigra*		1
Viola canina	1	5
Viola hirta		4
Viola palustris	1	5
Viola reichenbachiana		1
Viola riviniana		1
Viola tricolor subsp. *curtisii*	2	4
Viola tricolor subsp. *tricolor*	1	3
Vulpia ciliata subsp. *ambigua*		5
Vulpia fasciculata		5
Zannichellia palustris		2
Zostera marina		2
Zostera noltei		3

Appendix 2. Axiophytes and weighted scores by broad habitat

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	Broad habitat	No. of axiophytes	Weighted score
1	Broadleaved, mixed and yew woodland	78	163
2	Coniferous woodland	5	19
3	Boundary and linear features	73	205
4	Arable and horticultural	44	124
5	Improved grassland	2	4
6	Neutral grassland	49	139
7	Calcareous grassland	84	311
8	Acid grassland	53	227
9	Bracken	4	8
10	Dwarf shrub heath	28	134
11	Fen, marsh and swamp	113	405
12	Bog	23	149
13	Standing water and canals	65	171
14	Rivers and streams	53	141
15	Montane habitats	2	6
16	Inland rock (quarries, cliffs, screes)	56	184
17	Built-up areas and gardens	6	19
18	Supralittoral rock (does not include maritime grassland)	13	39
19	Supralittoral sediment (strandlines, shingle, coastal dunes)	48	177
21	Littoral sediment (includes saltmarsh and saltmarsh pools)	35	114

Appendix 3. Examples

a) Holt Lowes (SSSI), c. 49.5 Ha

Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Agrostis canina	3											3		3							
Aira praecox	4								4								4				
Anagallis tenella	3											3									
Athyrium filix-femina	2	2															2				
Briza media	3							3													
Calamagrostis canescens	1											1									
Calluna vulgaris	5										5		5								
Carex binervis	5								5		5						5				
Carex disticha	2											2									
Carex echinata	5											5	5		5						
Carex hostiana	5											5									
Carex nigra	3											3									
Carex panicea	4											4									
Carex paniculata	3	3										3									
Carex pilulifera	4								4												
Carex pseudocyperus	1											1									
Carex pulicaris	6											6					6				
Carex remota	1	1													1						
Carex rostrata	4											4									
Carex viridula subsp. brachyrrhyncha	5											5			5						
Carex viridula subsp. oedocarpa	5														5						
Ceratocapnos claviculata	2	2								2											
Chrysosplenium oppositifolium	2	2													2						
Cirsium dissectum	5											5									
Cuscuta epithymum	5										5										
Dactylorhiza fuchsii	2											2									
Dactylorhiza maculata	4												4								
Dactylorhiza praetermissa	3											3									
Dactylorhiza traunsteineri	5											5									
Danthonia decumbens	4							4	4												
Deschampsia flexuosa	4								4		4										
Drosera anglica	9											9	9								
Drosera rotundifolia	7												7								
Dryopteris carthusiana	1	1																			
Eleocharis multicaulis	6											6	6	6							
Eleocharis quinqueflora	6											6									
Epilobium palustre	2											2			2						
Epipactis palustris	5											5									
Equisetum fluviatile	2											2									
Equisetum sylvaticum	3	3															3				
Equisetum telmateia	1											1									
Erica cinerea	6										6										
Erica tetralix	7										7		7								
Eriophorum angustifolium	5												5								
Euphrasia nemorosa	2							2			2										
Festuca ovina agg.	3							3	3												
Frangula alnus	2	2																			
Galium saxatile	3								3	3											
Galium uliginosum	1											1									
Gymnadenia conopsea	5							5				5									
Hieracium sp.	2						2		2											2	
Hydrocotyle vulgaris	3											3									
Hypericum elodes	5											5									
Hypericum humifusum	3			3																	

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Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Hypericum pulchrum	3										3						3				
Isolepis setacea	2											2			2						
Juncus acutiflorus	4											4									
Juncus bulbosus	3														3						
Juncus squarrosus	5								5				5								
Juncus subnodulosus	4											4									
Listera ovata	1	1										1									
Lotus pedunculatus	1											1									
Luzula multiflora	3								3												
Lychnis flos-cuculi	1											1									
Menyanthes trifoliata	3											3									
Moehringia trinervia	1	1																			
Molinia caerulea	4												4								
Myosotis laxa	1											1									
Myosotis secunda	4											4									
Oenanthe fistulosa	2											2									
Oxalis acetosella	2	2	2														2				
Pedicularis palustris	6											6									
Pinguicula vulgaris	7											7	7								
Polygala serpyllifolia	6								6		6		6								
Potamogeton polygonifolius	4											4	4	4							
Potentilla erecta	4								4												
Potentilla palustris	4											4									
Pyrola minor	6	6															6				
Rhinanthus minor	2						2														
Rhynchospora alba	9												9								
Rumex acetosella	1								1	1							1				
Salix aurita	3	3															3				
Salix repens	4										4									4	
Sanicula europaea	1	1																			
Schoenoplectus lacustris	2													2	2						
Schoenus nigricans	7											7									
Scutellaria minor	6											6									
Solidago virgaurea	3										3						3				
Succisa pratensis	4						4														
Thelypteris palustris	2	2										2									
Trichophorum cespitosum	7										7		7								
Triglochin palustre	5											5									
Ulex gallii	5										5										
Valeriana dioica	4											4									
Viola reichenbachiana	1	1																			
Viola riviniana	1	1						1									1				
(97 axiophytes)	347	34	2	3	0	0	8	18	48	6	62	173	90	15	27	0	39	0	0	6	0
Maximum:		163	19	205	124	4	139	311	228	7	134	405	149	171	141	6	184	19	39	177	114
% of maximum:		21	11	1	0	0	6	6	21	86	46	43	60	9	19	0	21	0	0	3	0

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b) Beachamwell Fen (CWS), c. 16 Ha

Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Briza media	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex elata	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Carex panicea	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Carex viridula subsp. brachyrrhyncha	5	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0
Cirsium acaule	5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladium mariscus	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Cynoglossum officinale	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0
Festuca ovina agg.	3	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Festuca pratensis	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Filipendula vulgaris	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Helictotrichon pratense	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Helictotrichon pubescens	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus subnodulosus	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Koeleria macrantha	5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Leontodon hispidus	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Linum catharticum	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Listera ovata	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Lithospermum officinale	2	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Lotus corniculatus	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula campestris	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ononis spinosa	4	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago media	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygala vulgaris	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla erecta	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Primula veris	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunus padus	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhamnus cathartica	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sanguisorba minor subsp. minor	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Scabiosa columbaria	5	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Schoenus nigricans	7	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Stellaria palustris	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Trifolium medium	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(32 axiophytes)	103	5	0	3	0	0	15	62	7	0	0	30	0	0	5	0	0	0	0	3	0
Maximum:		163	19	205	124	4	139	311	228	7	134	405	149	171	141	6	184	19	39	177	114
% of maximum:		3	0	1	0	0	11	20	3	0	0	7	0	0	4	0	0	0	0	2	0

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c) Great Yarmouth, North Denes (SSSI), c. 73.5 Ha

Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Aira praecox	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	0	0
Allium vineale	2	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Ammophila arenaria	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Anthriscus caucalis	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Asplenium adiantum-nigrum	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Asplenium ruta-muraria	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0
Asplenium trichomanes	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0
Cakile maritima	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Calystegia soldanella	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Carex arenaria	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Catapodium marinum	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Cerastium arvense	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Cerastium diffusum	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0
Cerastium semidecandrum	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	3	0
Ceterach officinarum	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
Corynephorus canescens	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Crassula tillaea	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elytrigia juncea	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Erigeron acer	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Eryngium maritimum	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Euphorbia paralias	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Festuca ovina agg.	3	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Hieracium sp.	2	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2	0
Honckenya peploides	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Hordeum marinum	5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jasione montana	5	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0
Leontodon saxatilis	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Leymus arenarius	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Lotus corniculatus	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula campestris	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myosotis ramosissima	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	0	0
Ononis repens	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilosella officinarum	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantago coronopus	2	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Poa bulbosa	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Polypodium vulgare s. l.	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Rhinanthus minor	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rumex acetosella	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0
Salsola kali subsp. kali	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Sedum acre	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Stellaria pallida	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Teesdalia nudicaulis	6	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium arvense	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium subterraneum	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0
Trifolium suffocatum	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Vicia lathyroides	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0
Viola canina	5	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0
Vulpia fasciculata	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
(48 axiophytes)	164	2	0	28	1	0	18	17	55	1	10	0	0	0	0	0	35	7	13	61	0
Maximum:		163	19	205	124	4	139	311	228	7	134	405	149	171	141	6	184	19	39	177	114
% of maximum:		1	0	14	1	0	13	5	24	14	7	0	0	0	0	0	19	37	33	34	0

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d) Boyland Common (CWS), c. 3.9 Ha

Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Agrostis canina	3	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0
Briza media	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex otrubae	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Carex ovalis	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Festuca pratensis	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Genista tinctoria	6	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luzula campestris	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchis morio	6	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Primula veris	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus bulbosus	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Silaum silaus	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium ochroleucon	7	0	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(12 axiophytes)	36	0	0	8	0	0	28	12	0	0	1	4	0	3	0	0	0	0	0	0	0
Maximum:		163	19	205	124	4	139	311	228	7	134	405	149	171	141	6	184	19	39	177	114
% of maximum:		0	0	4	0	0	20	4	0	0	1	1	0	2	0	0	0	0	0	0	0

e) Lord Anson's Wood, c. 66 Ha

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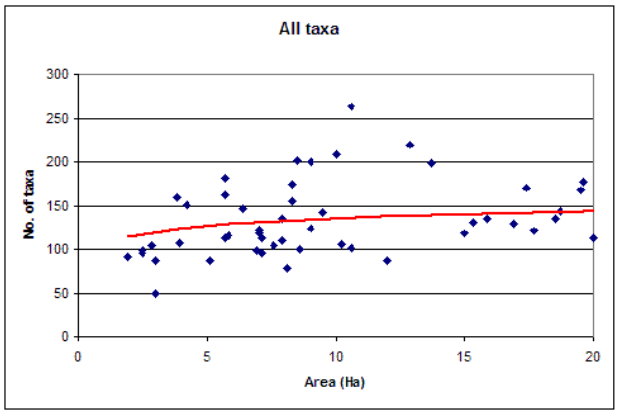
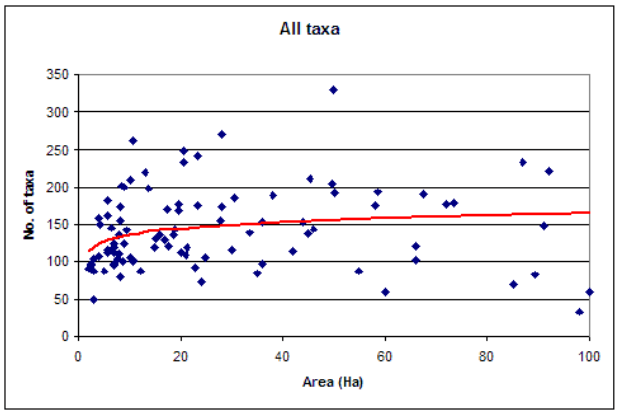
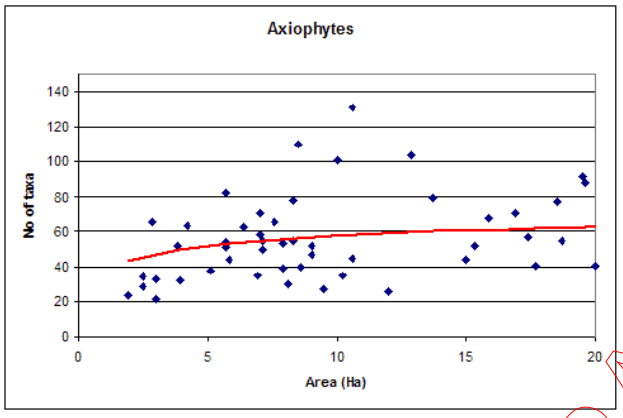
Taxon	Score	1 Broadleaved and mixed woodland	2 Coniferous woodland	3 Boundary and linear features	4 Arable and horticultural	5 Improved grassland	6 Neutral grassland	7 Calcareous grassland	8 Acid grassland	9 Bracken	10 Dwarf shrub heath	11 Fen, marsh and swamp	12 Bog	13 Standing water and canals	14 Rivers and streams	15 Montane habitats	16 Inland rock	17 Built-up areas and gardens	18 Supralittoral rock	19 Supralittoral sediment	21 Littoral sediment
Athyrium filix-femina	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Blechnum spicant	4	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0	0
Calluna vulgaris	5	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	0
Carex binervis	5	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	5	0	0	0	0
Carex ovalis	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Carex pilulifera	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Carex remota	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Carex sylvatica	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erica cinerea	6	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
Erica tetralix	7	0	0	0	0	0	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0
Festuca ovina agg.	3	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Galium saxatile	3	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0
Hypericum pulchrum	3	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0
Juncus bulbosus	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
Luzula multiflora	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Lythrum portula	4	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0
Molinia caerulea	4	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Polygala serpyllifolia	6	0	0	0	0	0	0	0	6	0	6	0	6	0	0	0	0	0	0	0	0
Rumex acetosella	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0
Veronica officinalis	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Viola riviniana	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
(12 axiophytes)	68	9	4	1	0	0	0	5	26	4	37	4	22	4	4	0	16	0	0	0	0
Maximum:		163	19	205	124	4	139	311	228	7	134	405	149	171	141	6	184	19	39	177	114
% of maximum:		6	21	0	0	0	0	2	11	57	28	1	15	2	3	0	9	0	0	0	0

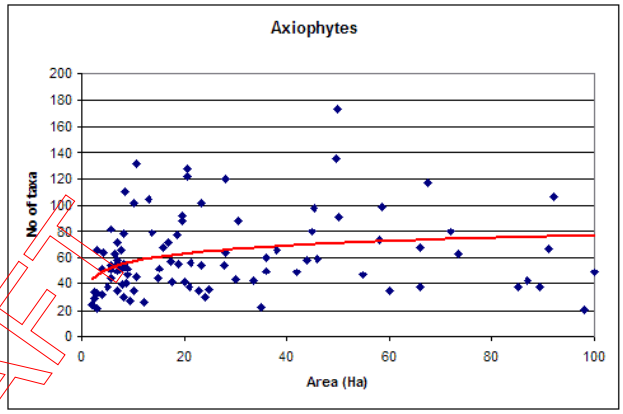
Appendix 4. No. of species, axiophytes and weighted scores vs. site area.

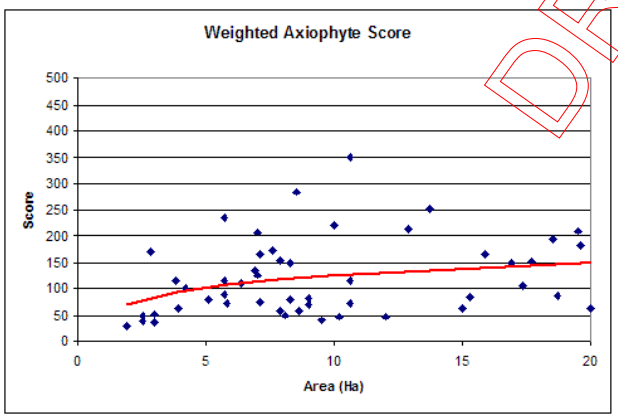
The first column includes sites up to 20 hectares and the second up to 100 hectares.
The smallest site considered was 1.9 Ha – it might be interesting to look at some smaller sites

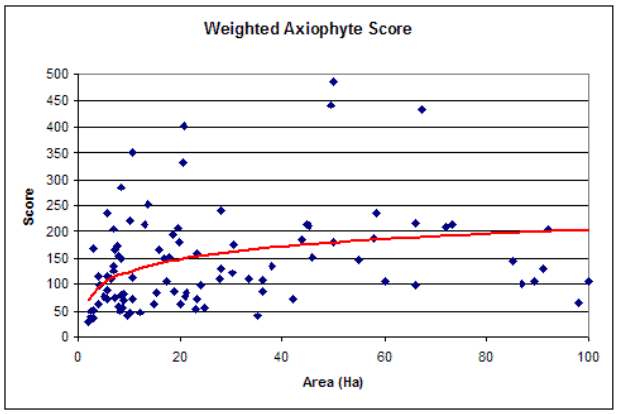












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